



The worldwide growth in Internet traffic continues unabated. Although video applications account for the largest portion of this growth, other big drivers are mobile and emerging social applications. In a networked economy, the quality of connectivity impacts business performance. Carriers must translate this dependence into profitability, which means finding new ways to lower costs on existing services, developing new revenue generating services, and evolving business models to the changing network landscape.

The T4000 Core Router provides the scalability and flexibility required to meet this diverse set of requirements. With rich service processing, the industry's highest per-slot throughput of 240 Gbps, and in-service hardware upgrade capability, the T4000 is the ideal service provider platform, offering unprecedented investment protection and operational economics to profitably manage a core infrastructure.

T4000 CORE ROUTER

Product Description

The Juniper Networks® T4000 Core Router is the next generation of T Series routers, extending Juniper's proven history of innovation and investment protection. The T4000 system more than doubles the per-slot capacity of existing T1600 systems from 100 Gbps to 240 Gbps—and with only 25% increase in power. A fully loaded T4000 system can support up to 192 ports of 10GbE, or 16 ports of 100GbE interfaces, making it the densest line rate IP/MPLS routing system. The T4000 is a true multiservice core system that is designed to deliver a reliable, high-performance, and flexible architecture to carry a wide breadth of services over a common IP/MPLS infrastructure.

With four terabits of line rate throughput in a half rack chassis, the T4000 offers double the slot capacity of the nearest competitor. In addition, all existing T640 and T1600 systems can be upgraded in service to T4000 systems, offering ultimate investment protection to the existing T Series installed base.

T Series routers enable service providers to deliver stringent quality of service (QoS) and meet service-level agreements (SLAs) for multiservice transit and IP services. In addition, Juniper's industry-leading IP/MPLS capabilities guarantee that the service level and performance of critical services are maintained, while extending the effective life span of legacy network assets. The T Series is ideal for creating routed infrastructures that must scale to meet constantly growing Internet traffic for all varieties of applications. Furthermore, capacity-based power consumption for all T Series routers is the lowest in the industry. The following table illustrates the scaling characteristics of the T Series family.

Table 1: T Series Core Routers Scaling Characteristics

T SERIES PLATFORM	THROUGHPUT	RACK SPACE	10-GIGABIT ETHERNET DENSITY	100-GIGABIT ETHERNET DENSITY	FULLY REDUNDANT HARDWARE	MULTICHASSIS CAPABLE
T320	320 Gbps	1/3 rack (19 in)	16	N/A	Yes	No
T640	640 Gbps	1/2 rack (19 in)	32	N/A	Yes	Yes
T1600	1.6 Tbps	1/2 rack (19 in)	80 (line rate) 160 (oversubscribed)	8	Yes	Yes
T4000	3.84 Tbps	1/2 rack (19 in)	192 (line rate) 384 (oversubscribed)	16	Yes	Yes

Network Virtualization

Hardware virtualization enables operators to consolidate networks (corporate and residential) and nodes (core and aggregation) onto a single simplified infrastructure. The result is high CapEx and OpEx savings, secure administrative isolation between services, and rapid introduction of new services. The T4000 system along with the Juniper Networks JCS1200 Control System—the industry's first purpose-built, control plane scaling platform—will continue to provide operators the flexibility of consolidating or separating network components based on their service needs.

Architecture and Key Components

The core network is the heart of any next-generation network or multiplay deployment. With the growth of distributed content in metro networks, and emerging video, social networking, and mobile applications, the core network must deliver high-speed transport at five 9s reliability, and, at the same time, provide rich service delivery features. The T4000 system offers providers the premier core routing option in the industry—an ultra high capacity core with the ability to support hardware virtualization. Juniper Networks Junos® operating system functionality offers the most resilient, high-performance, and flexible applications for backbone carriage of content-intensive consumer and business traffic.

High Availability

The T Series architecture allows all Junos OS features and services to operate across many interface types without compromising performance. From its inception, Junos OS was

developed for rigorous service provider needs. For example, Junos OS is completely modular so that in the unlikely event one module experiences a problem, it is isolated to that specific section of code and does not bring down an entire system. On the hardware side, all major components—including Routing Engines, Control Boards (CBs), Switch Interface Boards (SIBs), and Power Equipment Modules (PEMs)—are redundant.

In-Service Hardware Upgrade

One of the key architectural choices in the T Series family of routers is the nondisruptive hardware upgrade. Juniper provides unique capabilities for upgrading existing T640 and T1600 routers to T4000 routers. Following such an upgrade, the T4000 provides more than double the capacity of T1600, while only using about 25% more power. The steps highlighting such an upgrade procedure are shown in Figure 1 below.

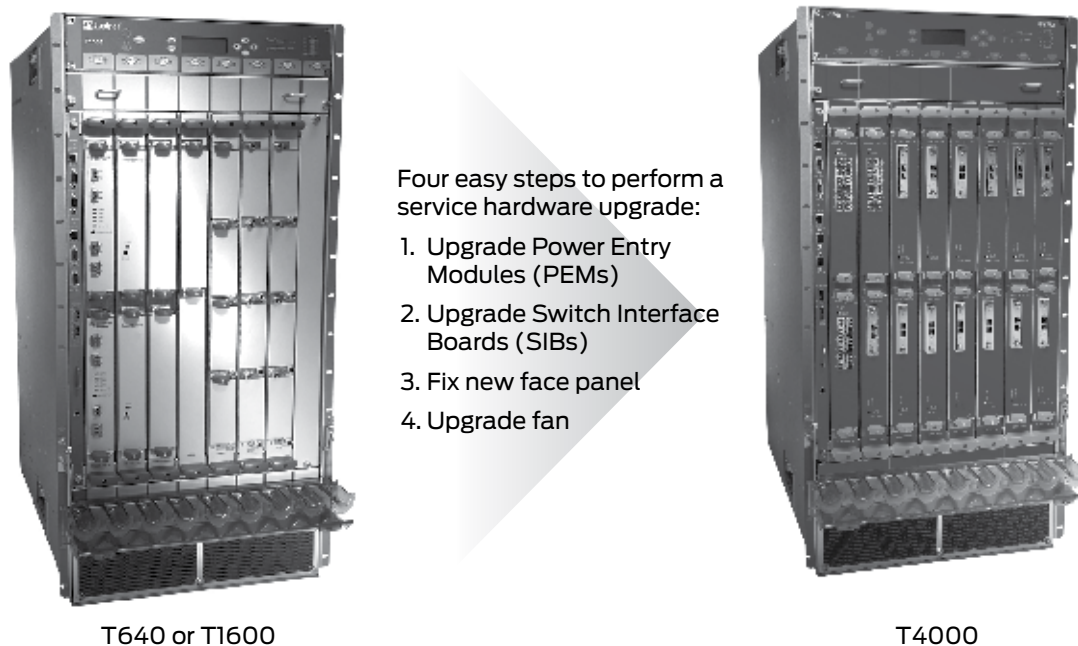


Figure 1: In-service hardware upgrade of T640 or T1600 to T4000 in four easy steps

Features and Benefits

The T Series routers are a proven architecture, with over 6,000 units deployed in the world's largest networks.

Table 2: T Series Features and Benefits

FEATURE	DESCRIPTION	BENEFIT
Multi-terabit capacity and multichassis scalability	The T4000 supports 4 Tbps in a single chassis and is multichassis capable. This future-proofed architecture scales comfortably as provider needs progress.	T4000 scale and density features allow service providers to increase capacity without adding additional systems to the network.
High availability (HA) hardware	There is no single point of failure in T Series routers. Component-level redundancy is available for Routing Engines, CBs, and SIBs, as well as PEMs and the internal control plane.	HA and continuous operation is critical in core routing, where loss of a single routing node can remove service for a wide geographical area.
HA software	T4000 supports continuous operation under maintenance conditions, and topological changes by means of nonstop active routing (NSR) and unified in-service software upgrade (unified ISSU).	HA requirements in core networks include the elimination of planned downtime, giving the benefit of better network stability, easier operations, and less operational risk.
Superior packet processing via programmable ASIC-based Packet Forwarding Engine (PFE)	The T4000 programmable ASICs family delivers a comprehensive, hardware-based system for rich processing.	Features such as highly granular QoS, advanced filter-based forwarding, and flow-based monitoring are a key component for providing wide ranging services on a single network.
Wide range of interfaces	Interfaces on the T Series range from DS3 to OC-768 (SONET) and 100GbE for Ethernet. The T4000 provides the largest variety of interfaces in the densest form factor among core routing platforms.	Combining the functions of previously disparate network elements offers greater network simplicity, and retains the service building advantages of the overlay networks being replaced by the converged network.

Specifications

Physical dimensions (W x H x D)

- 17.43 x 37.45 x 31 in (44.27 x 95.12 x 78.74 cm)

Maximum weight

- 606 lb (274.88 kg)

Mounting

- Front or center rack mount

Power system rating (agency label)

- 11.5 kilowatt

Environmental

Temperature

- 32° to 104° F (0 to 40° C)

Maximum altitude

- No performance degradation to 10,000 ft (3,048 m)

Relative humidity

- 5% to 90% noncondensing

Seismic /earthquake

- Designed to meet Telcordia Zone 4 requirements

Approvals

Safety

- CAN/CSA-C22.2 No. 60950-00/UL 60950 – Third Edition, Safety of Information Technology Equipment
- EN 60825-1 Safety of Laser Products – Part 1: Equipment Classification, Requirements and User's Guide

- EN 60825-2 Safety of Laser Products – Part 2: Safety of Optical Fibre Communications Systems
- EN 60950 Safety of Information Technology Equipment

Electromagnetic compatibility (EMC)

- AS/NZS 3548 Class A (Australia / New Zealand), BSMI Class A (Taiwan), EN 55022 Class A emissions (Europe), FCC Class A (USA), VCCI Class A (Japan)

Immunity

- EN 61000-3-2 Power Line Harmonics, EN 61000-4-2 ESD, EN 61000-4-3 Radiated Immunity, EN 61000-4-4 EFT, EN 61000-4-5 Surge, EN 61000-4-6 Low Frequency Common Immunity, EN 61000-4-11 Voltage Dips and Sags

Network Equipment Building System (NEBS)

Juniper Networks TX Matrix, T640, and T320 are designed to comply with the following NEBs standards.

- GR-63-CORE: NEBS, Physical Protection
- GR-1089-CORE: EMC and Electrical Safety for Network Telecommunications Equipment
- SR-3580 NEBS Criteria Levels (Level 3 Compliance)

European Telecommunications Standardization Institute (ETSI)

- TS-300386-2 Telecommunication Network Equipment Electromagnetic Compatibility

Juniper Networks Services and Support

Juniper Networks is the leader in performance-enabling services and support, which are designed to accelerate, extend, and optimize your high-performance network. Our services allow you to bring revenue-generating capabilities online faster so you can realize bigger productivity gains and faster rollouts of new business models and ventures. At the same time, Juniper Networks ensures operational excellence by optimizing your network to maintain required levels of performance, reliability, and availability. For more details, please visit www.juniper.net/us/en/products-services.

About Juniper Networks

Juniper Networks is in the business of network innovation. From devices to data centers, from consumers to cloud providers, Juniper Networks delivers the software, silicon and systems that transform the experience and economics of networking. The company serves customers and partners worldwide. Additional information can be found at www.juniper.net.

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